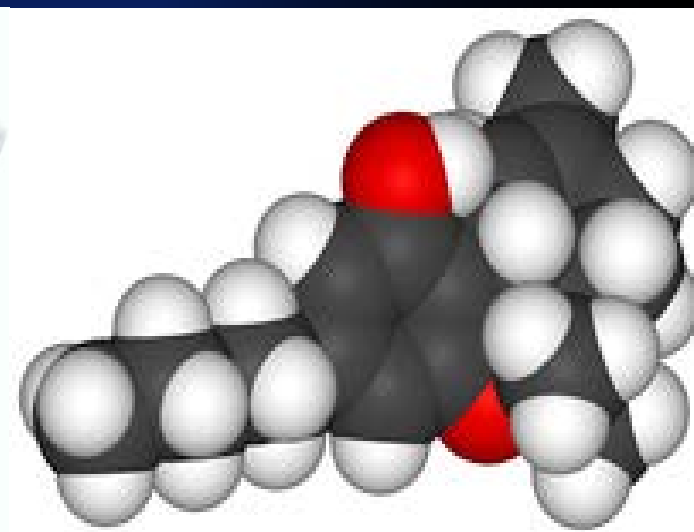
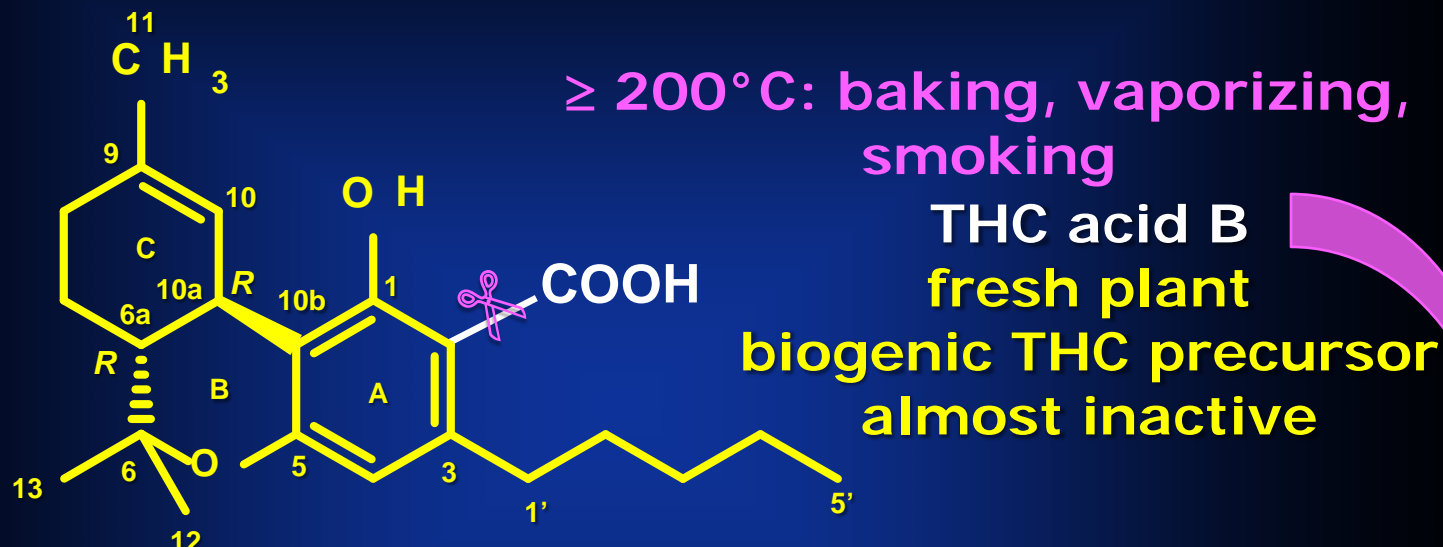


Pharmacokinetics and Administration Modes of Cannabinoids – A Challenge



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rudolf.brenneisen@dkf.unibe.ch

Chemistry of THC - The Decarboxylation



Delta-9-Tetrahydrocannabinol (THC) Active

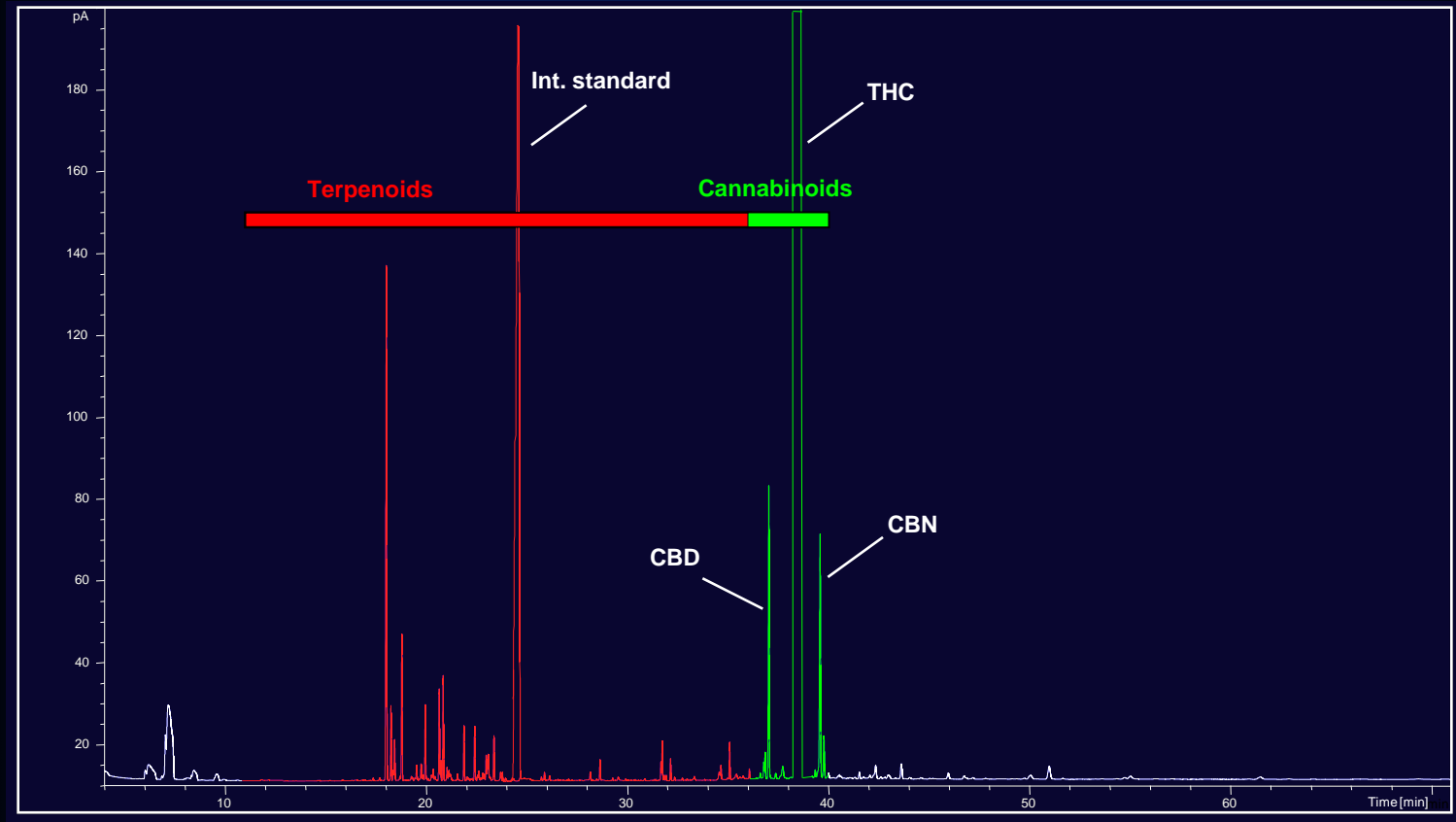
Isolated 1942 (Wollner), structure 1964 (Mechoulam)

BP $\approx 160^{\circ}\text{C}$

Solubility $\approx 3 \text{ mg/L}$ water RT (0.0003%)

Chemistry of Cannabis - The Chemical Factory

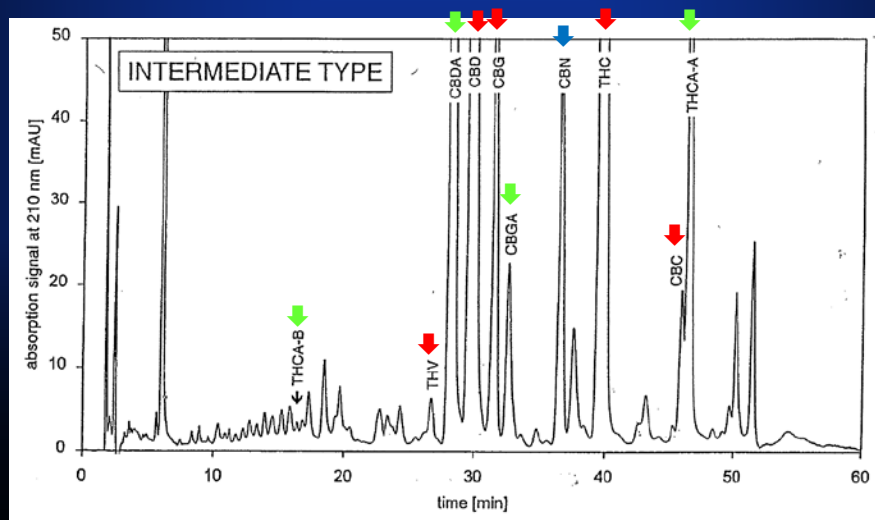
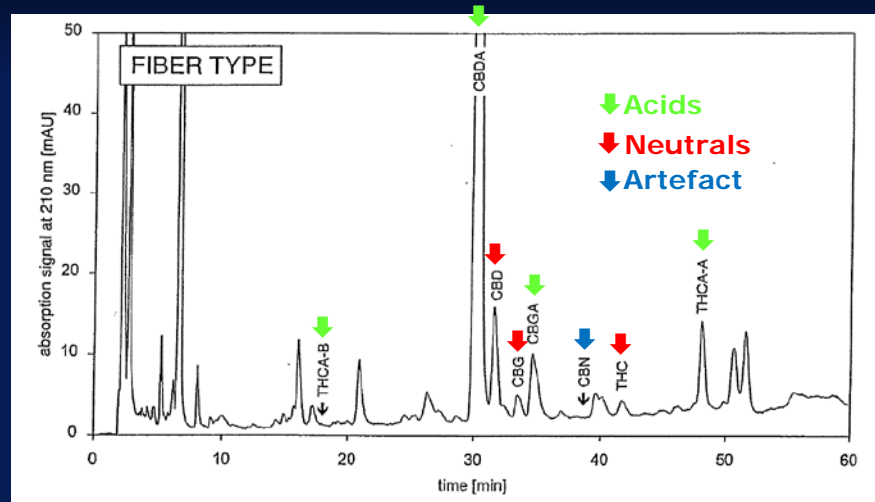
GC profiling/fingerprints



[Brenneisen & Meyer 2005]

Chemistry of Cannabis - The Chemical Factory

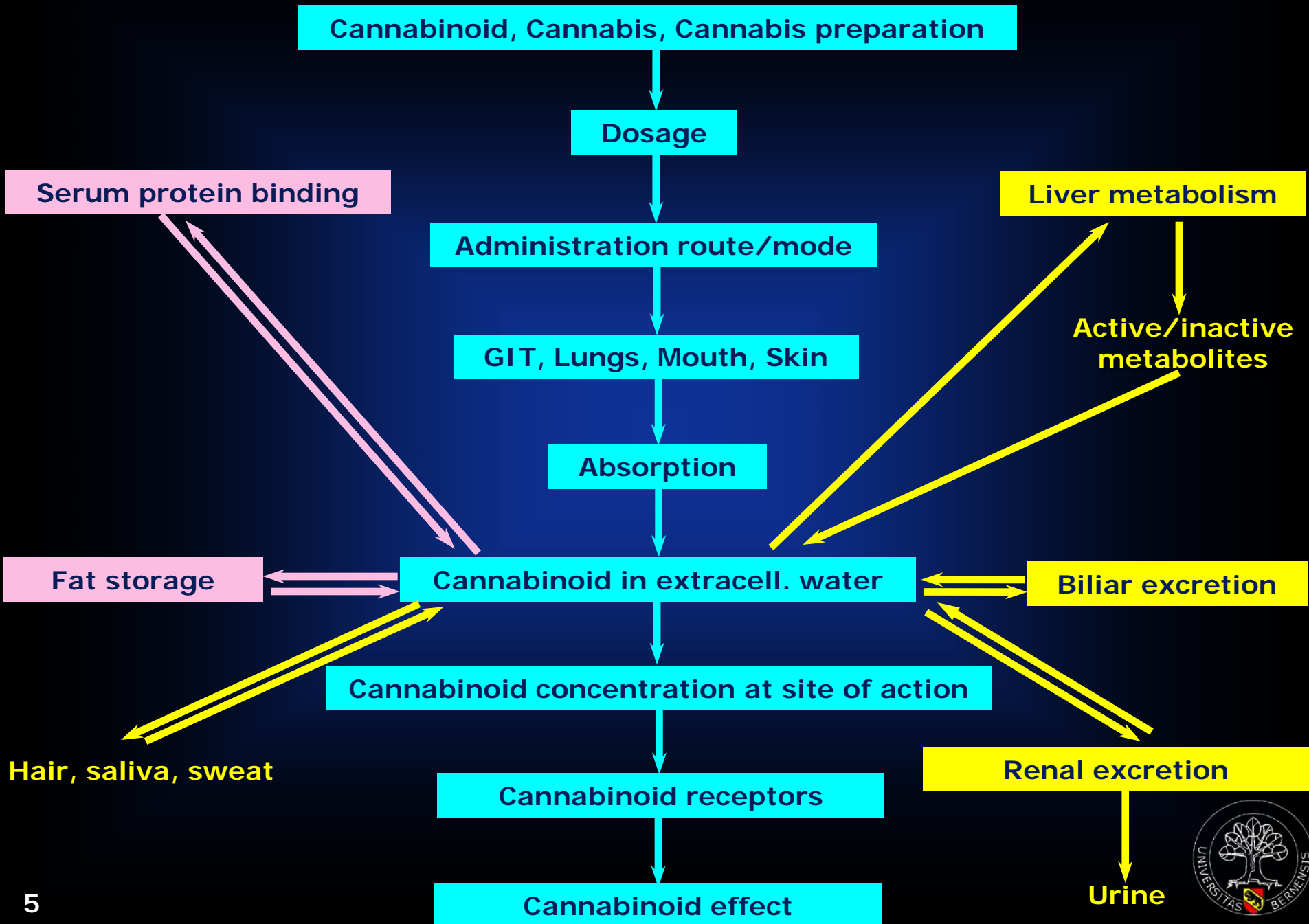
HPLC profiling/fingerprints



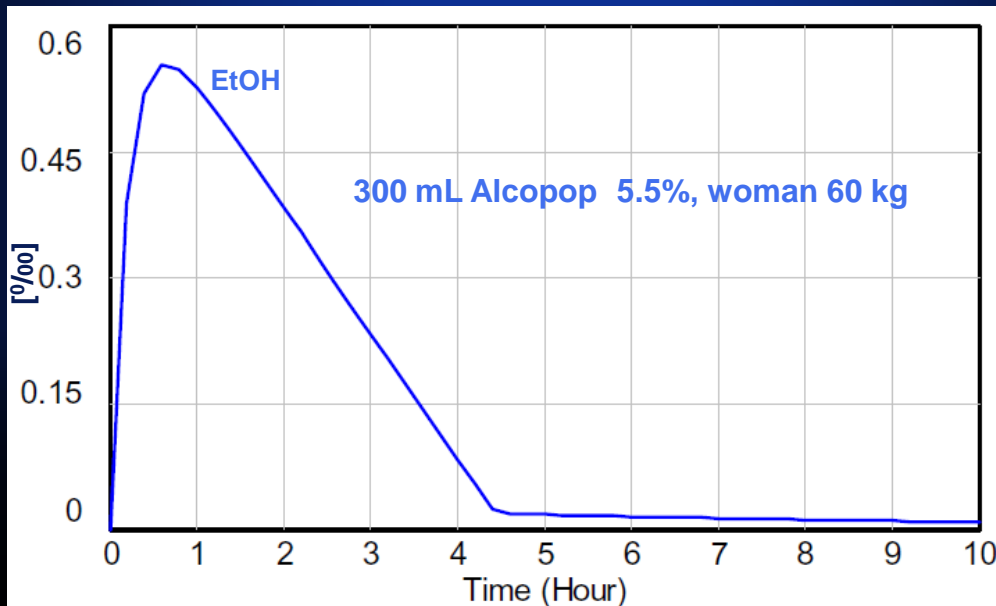
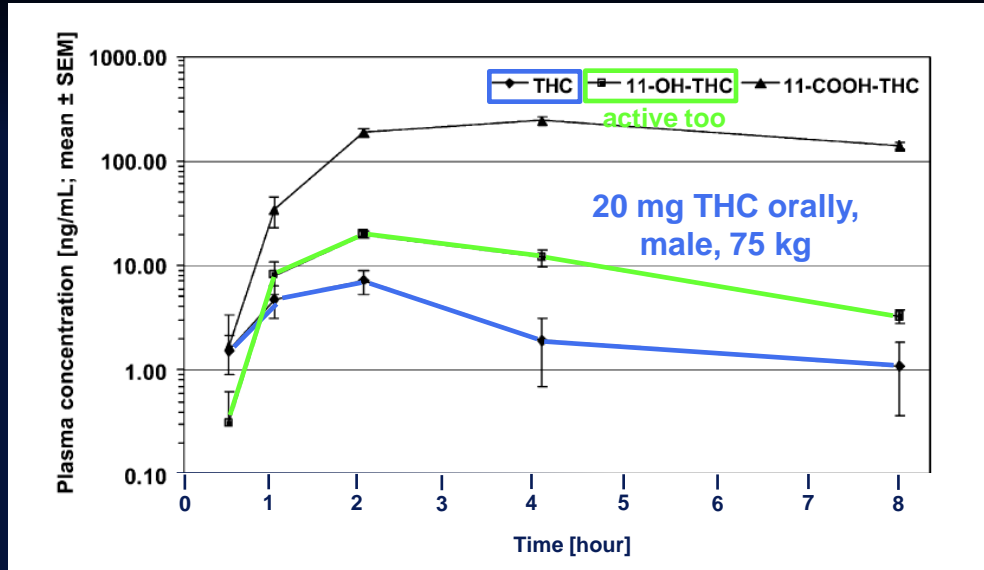
[Lehmann & Brenneisen 1995]



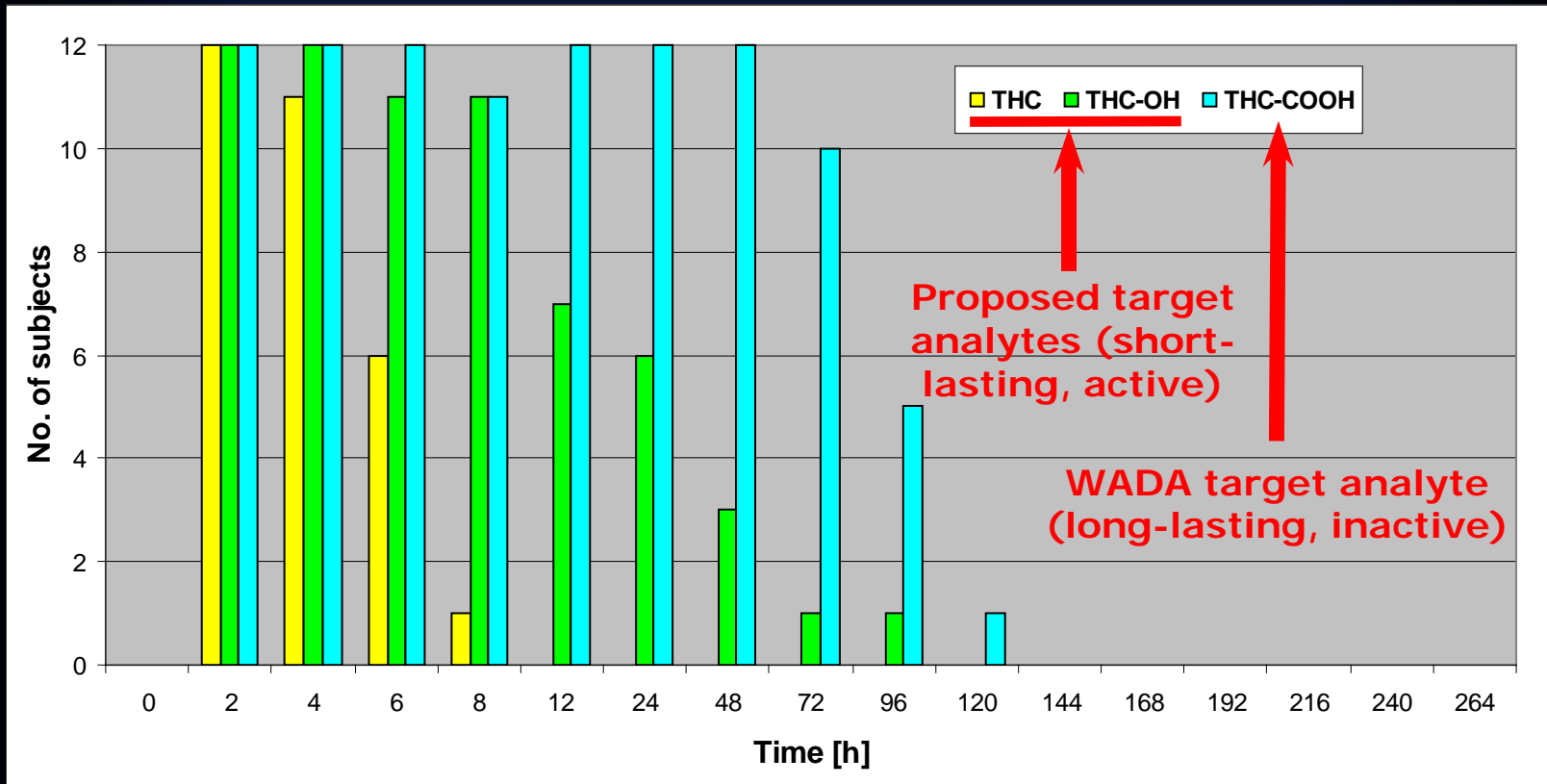
The Complex Fate of Cannabinoids in the Body



Elimination from Blood – THC vs Alcohol



The Doping Trap

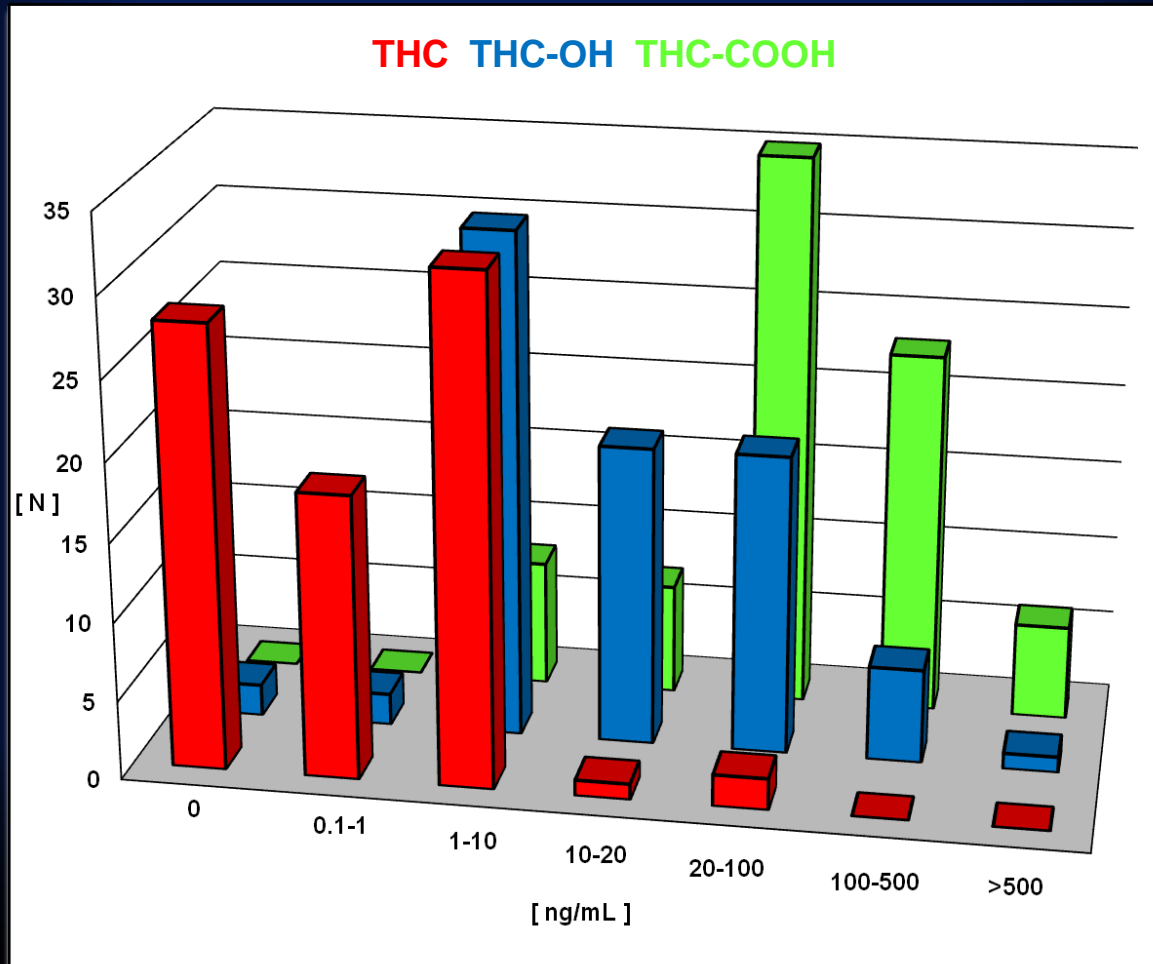


[Brenneisen et al 2010]



Multinational Field Study

Reanalysis of cannabis-positive athletes' urines (≥ 15 ng/mL THC-COOH; N = 79)

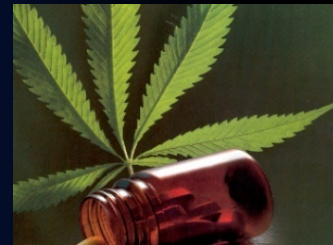


Cannabinoid Drugs and Application Forms

Folk medicine, self-treatment:

➔ Cannabis and home made preparations

- Joint, tea, „Sativa-Oil“, „Simpson Oil etc.
- Street Cannabis
- Quality and dosage not controlled
- Harmful or inefficient application modes.



Academic, evidence-based medicine:

➔ Cannabinoid-based medicines, „TBMs“, „CBDMs“

- THC (dronabinol, Marinol®)
- Nabilone (Cesamet®)
- Cannabidiol, CBD.

➔ Cannabis-based medicines, „CBMs“

- Standardized extracts (Sativex®)
- Buds (Bedrobinol®, Bediol® etc.)
- Established galenic formulations, „formula magistralis“ preparations (tincture, drops etc.)
- Quality and dosage controlled
- Less harmful and more efficient application forms.



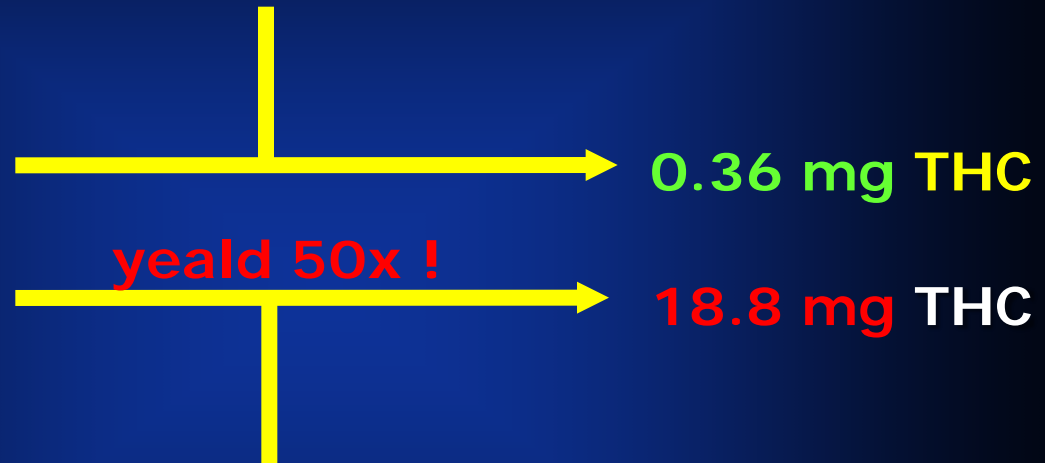
Cannabinoid Drugs and Application Forms

Galenic formulation	Bioavailability	Effect
Cannabis cigarette (smoke)	15-25 %	rapid
Cannabis inhalation aerosol (vapor)	50-90	rapid
Cannabis sublingual spray	>90	slow
Cannabis capsule	?	slow
Cannabis tea	low	slow
Cannabis oil	?	slow
THC capsule	5-20	slow
THC drops	5-20	slow
THC suppository	20-40	rel. rapid
THC patch	?	?
THC injection solution	100	very rapid



CBMs - Cannabis Tea

3.6 g cannabis, 200 mL water,
30 min boiling



3.6 g cannabis, 200 mL milk/coffee creamer,
30 min boiling

[Giroud 1997, Hazekamp 2007]

CBMs - Sativa Oil

Validated home recipe for ALS patients



**3 g cannabis,
13 % THC**

**60 mL peanut oil
200°C/45 min**

**7.8 mg THC/mL \approx 90% yield,
but loss of terpenoids!**



CBMs - Simpson Oil

Rick Simpson Cannabis Oil

Concentrated extract

Naptha as solvent ➡ toxic residues
➡ olive oil to be preferred [Hazekamp 2013]

Not validated and clinically not tested cannabis preparation

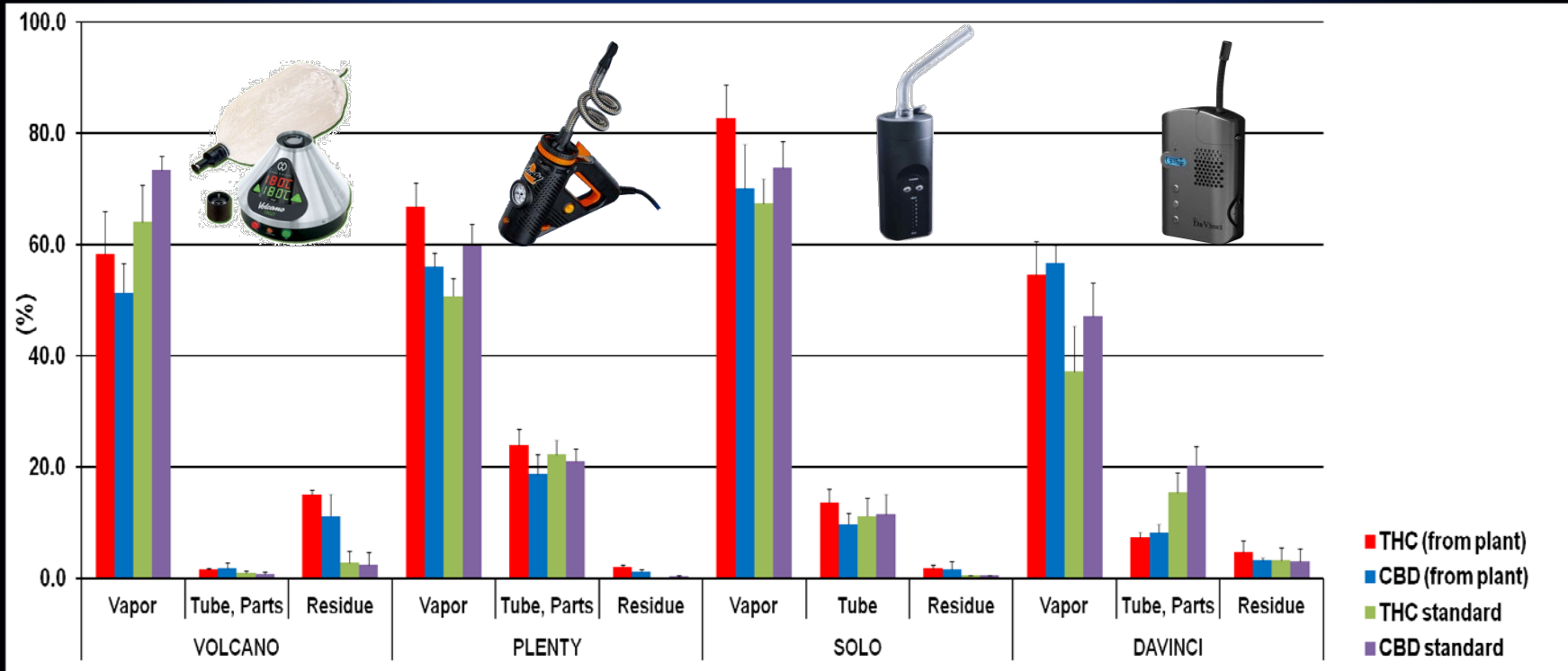
Good for treating cancer?



CBM/TBM/CBDM - Vaporization

Non-pyrolytic inhalation In vitro validation of commercial vaporizer devices

[%]

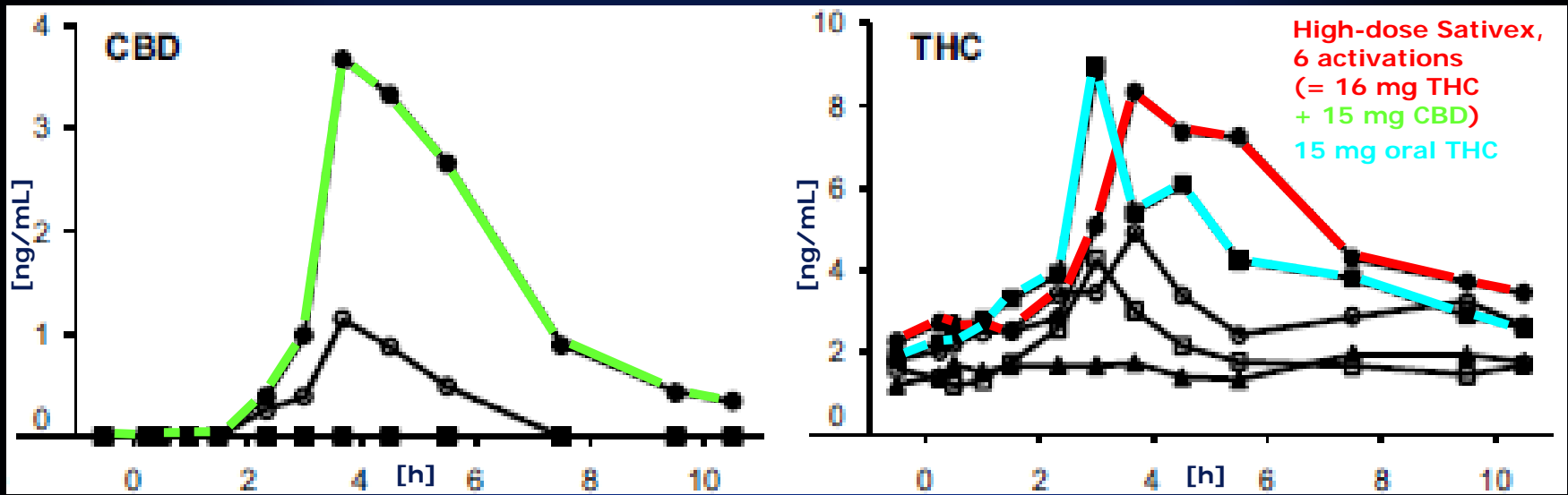


[Lanz 2013, unpublished]



Oromucosal Spray (Sativex®)

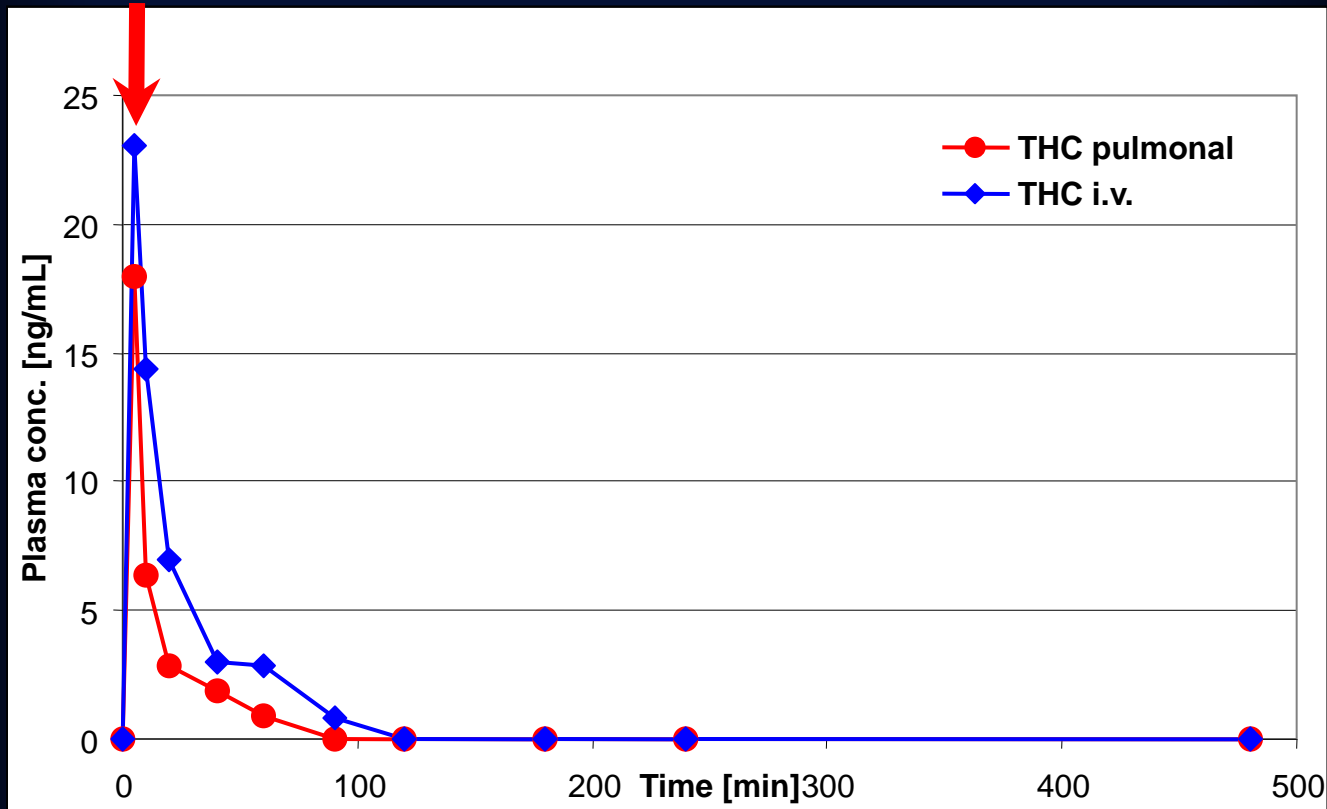
TBM vs. CBM, plasma levels



[Karschner 2011]

TBMs – Inhalation Spray vs. Injection Solution

Rapid onset of action
But also flash!



[Naef 2003]



Cannabinoid Drugs and Application Forms

Options and Visions

Folk medicine, self-treatment without prescription:

- ➔ Access to Medicinal Cannabis with quality certificate
- ➔ Preferably using validated home recipes and harmless application forms (e.g. vaporizer)
- ➔ No criminalization of patient, even if not (yet) compatible with law.

Academic medicine, controlled treatment with prescription:

- ➔ Approved drugs (TBMs, CBDMs and CBMs)
- ➔ Medicinal Cannabis from licensed producers and suppliers, i.e. public pharmacies
- ➔ Pharmacopoeia monographs
- ➔ Optimized, patient-individualized formulations, „formula magistralis“, respecting GMP.



Recommended Web Links

Swiss Task Force for Cannabinoids in Medicine, STCM



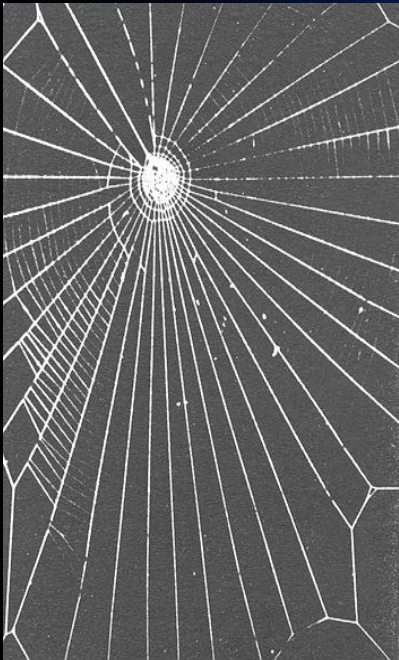
International Association for Cannabinoid Medicines, IACM



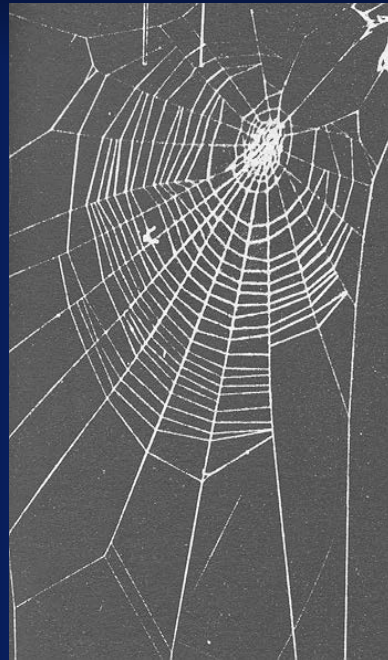
International Cannabinoid Research Society, ICRS



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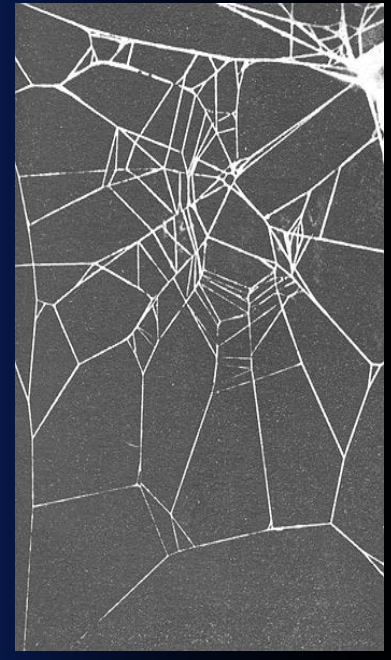
LSD



Cannabis



Mescaline



Kaffee

[Mardikar 1969]



Thank You !

